Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI EXAMINATION – WINTER 2025

Subject Code:3161009 Date:25-11-2025

Subject Name:Embedded Systems

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Describe criteria to choose microcontroller for designing embedded system.	**03**
	(b)	Describe use of FPGA and SoC to design Embedded system.	**04**
	(c)	Describe CAN bus protocol with merits and demerits.	**07**
Q.2	**(a)**	Compare Synchronous and Asynchronous serial communication method.	**03**
	(b)	Describe how WDT can used to solve unavoidable software loop.	**04**
	(c)	Compare UART, SPI, I2C, USB protocol for different criteria.	**07**
		OR	
	(c)	Describe AMBA protocol and its variant.	**07**
Q.3	**(a)**	Define Interrupt Deadline. How embedded software designer solve interrupt deadline problem?	**03**
	(b)	Describe use of DMA in embedded system design for data transfer form IO device to memory.	**04**
	(c)	Describe different types of semaphore and its related OS level functions. How it can be used as resource handling mechanism?	**07**
		OR	
Q.3	**(a)**	Define interrupt latency. Describe equations to find interrupt latency.	**03**
	(b)	Describe types of device driver with examples.	**04**
	(c)	Describe priority inversion problem. How to solve it?	**07**
Q.4	**(a)**	Define RTOS. Describe its type with examples.	**03**
	(b)	Describe Function Queue Scheduling mechanism.	**04**
	(c)	Describe Mailbox functions and RPC used for inter-process communication.	**07**
		OR	
Q.4	**(a)**	Compare pre-emptive and co-operative scheduling mechanism.	**03**
	(b)	Describe Earlier Deadline First (EDF) scheduling mechanism.	**04**
	(c)	Describe Lock, Unlock and Spin-lock mechanism used for inter-process communication.	**07**

Q.5 **(a)** Describe MSP430 block diagram and CPU registers. **03**

(b) Describe how to achieve low-power modes in MSP430. **04**

(c) Write a MSP430 C-program to transmit "GTU EXAM" continuously using UART at 9600 baudrate. Assume SMCLK = 1MHz **07**

OR

Q.5 **(a)** Enlist features of ADC10 block in MSP430. For MSP430, Why CPU temperature and power supply is converted in digital? **03**

(b) Describe clocking system in MSP430. Is it possible to drive all peripherals of MSP430 at master clock speed? Justify your answer. **04**

(c) Sketch interfacing diagram to interface one switch at P1.3 and two LEDs at P1.0 and P1.6 with MSP430 board. Write C-program to do following **07**

Switch (P1.3)	LED1 (P1.0)	LED2 (P1.6)
Pressed (Logic-0)	ON	OFF
Released (Logic-1)	OFF	ON

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Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI (NEW) EXAMINATION – WINTER 2024

Subject Code:3161009 Date:05-12-2024

Subject Name:Embedded Systems

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Define Embedded Systems.	**03**
	(b)	Describe the components of an Embedded System.	**04**
	(c)	Discuss the design process in embedded systems with examples.	**07**
Q.2	**(a)**	Explain the role of Timer and Counting Devices in embedded systems.	**03**
	(b)	Compare and contrast various Serial Communication protocols.	**04**
	(c)	Discuss the features and applications of Parallel Communication protocols.	**07**
		OR	
	(c)	Explain Wireless Communication protocols and their significance in embedded systems.	**07**
Q.3	**(a)**	What is an Interrupt Service Routine (ISR)?	**03**
	(b)	Describe the concept of Interrupt Latency and its impact.	**04**
	(c)	Explain the role of Device Driver Programming in embedded systems.	**07**
		OR	
Q.3	**(a)**	Discuss the context-switching mechanism in the presence of multiple interrupts.	**03**
	(b)	Explain the Direct Memory Access (DMA) concept.	**04**
	(c)	Describe the classification of processor interrupt service mechanisms	**07**
Q.4	**(a)**	Explain the significance of semaphores in inter-process communication.	**03**
	(b)	Discuss various IPC mechanisms such as message queues and sockets.	**04**
	(c)	Compare the characteristics of tasks and ISRs.	**07**
		OR	
Q.4	**(a)**	Describe shared data management in multi-threaded applications.	**03**
	(b)	Explain the use of Pipe Functions in IPC.	**04**
	(c)	Discuss the role of signal functions in process communication.	**07**
Q.5	**(a)**	Define the key features of an Operating System.	**03**
	(b)	Compare cooperative and preemptive multitasking.	**04**
	(c)	Compare Rate-Monotonic Scheduling and Earliest-Deadline First Scheduling.	**07**
		OR	

Q.5	**(a)**	What are the key features of the MSP430 architecture?	**03**
	(b)	Explain the difference between clock-driven and event-driven scheduling.	**04**
	(c)	Discuss the low-power features of MSP430 microcontrollers.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2023

Subject Code:3161009 Date:13-12-2023

Subject Name:Embedded Systems

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define Embedded system. Describe its type with two example of each.	**03**
	(b)	Define RTOS. Describe its type with example.	**04**
	(c)	Compare UART, I2C, SPI protocol. Give advantage of each protocol over other protocol.	**07**
Q.2	**(a)**	Describe Synchronous, Iso-synchronous, and Asynchronous communication.	**03**
	(b)	Describe use of RTC and WDT in Embedded system.	**04**
	(c)	Describe CAN bus protocol.	**07**
		OR	
	(c)	Describe and compare Wi-fi and Bluetooth protocol.	**07**
Q.3	**(a)**	Define interrupt, interrupt latency, Task Deadline.	**03**
	(b)	Describe device driver used in embedded system.	**04**
	(c)	Describe dead-lock condition with example in embedded system. How to come out of dead-lock condition?	**07**
		OR	
Q.3	**(a)**	Describe polled based IO and interrupt based IO.	**03**
	(b)	Sketch diagram to interface DMA with microprocessor or microcontroller.	**04**
	(c)	Describe shared data problem with example.	**07**
Q.4	**(a)**	Enlist co-operative scheduling mechanism	**03**
	(b)	Compare Process, Thread and Function.	**04**
	(c)	Describe Earlier Deadline First (EDF) and rate-monotonic scheduling mechanism.	**07**
		OR	
Q.4	**(a)**	Enlist pre-emptive scheduling mechanism.	**03**
	(b)	Describe PV Semaphore with example.	**04**
	(c)	Describe Round-robin with interrupt scheduling with example.	**07**
Q.5	**(a)**	Describe MSP430 USCI module and its modes.	**03**
	(b)	Describe low-power modes of MSP430.	**04**
	(c)	Write a C-program to generate square wave of 100Hz using timer-A. Assume SMCLK = 1MHz	**07**
		OR	
Q.5	**(a)**	Describe multiplexing scheme of MSP430 pins.	**03**
	(b)	Describe reset condition of MSP430: BOR, POR and PUC	**04**
	(c)	Sketch interfacing diagram to interface 8 LEDs with MSP430. Turn-ON LEDs in ring counter fashion.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) EXAMINATION – WINTER 2022

Subject Code:3161009 Date:17-12-2022

Subject Name:Embedded Systems

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Classify Embedded system and discuss the various components of embedded system design in brief.	**03**
	(b)	Explain SPI bus protocol to establish serial communication between a processor and a device.	**04**
	(c)	List and explain the protocols used for wireless and mobile system communication.	**07**
Q.2	**(a)**	Discuss shared data problems and give solutions to such problems.	**03**
	(b)	What do you understand by Interrupt Service Thread? Explain its usage with an example in RTOS based systems.	**04**
	(c)	What is a device driver? What are its requirements? Describe the information required for writing a device driver.	**07**
		OR	
	(c)	What is DMA? Using diagram show the operation of a DMA controller.	**07**
Q.3	**(a)**	Name all the RTOS task scheduling models. Describe any one in brief.	**03**
	(b)	State the differences between a Task, a Function and an Interrupt Service Routine.	**04**
	(c)	Describe the features available with Watch Dog Timer along with its requirements in embedded system design.	**07**
		OR	
Q.3	**(a)**	Define Interrupt Latency and Interrupt Service Deadline. Describe the parameters that govern their values.	**03**
	(b)	Explain concept of interrupt service routine.	**04**
	(c)	Describe the significance of File and I/O management along with supported functions in RTOS	**07**
Q.4	**(a)**	Compare hard real time and soft real time.	**03**
	(b)	Write short note on memory management.	**04**
	(c)	Compare process, task and thread with appropriate example. Also explain multithreading mechanism in context of display process of mobile phone.	**07**
		OR	
Q.4	**(a)**	What is a Scheduler? Explain any one scheduling policies.	**03**
	(b)	Discuss use of a semaphore as an event signaling or notifying variable in brief.	**04**
	(c)	What do you mean by Mutex. Also explain P and V semaphore with appropriate example.	**07**

Q.5	**(a)**	Explain the multiplexing scheme in MSP430 processor for the port pins.	**03**
	(b)	Explain the clocking system of MSP430.	**04**
	(c)	Describe the interrupt feature associated with Timer in MSP430.	**07**

OR

Q.5	**(a)**	Explain the special features associated with GPIO port pins in MSP430 other than simple digital input output port pin characteristics.	**03**
	(b)	Draw and explain the basic architecture and block diagram of MSP430.	**04**
	(c)	Explain a Timer module of MSP430 with various modes of operation associated with it.	**07**

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